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INVESTMENT, PRICES, BUDGET AND FINANCE

EFFECTIVE USE OF FINANCIAL RESOURCES IN ECONOMIC MANAGEMENT

Moscow IZVESTIYA AKADEMII NAUK SSSR; SERIYA EKONOMICHESKAYA in Russian
No 3, May-Jun 80 pp 55-68

[Article by V. A. Volkonskiy: "Questions of the Consideration of the Effectiveness of Resources in Economic Management"]

[Text] The effectiveness of such tools of economic management as the fee for productive capital and interest for credit and the trend toward the repeal of the fee for capital in some socialist countries are discussed in the article. Data on the decrease of the marginal effectiveness of capital investments with an increase of their amount for some sectors of industry are cited. The need to use the category "the effect of management" is substantiated.

The assurance of a balance of the needs of economic units for resources and the means of meeting them is one of the most important economic methods of management and planning, at the basis of which are the appraisals of the effectiveness of capital investments, fixed capital, manpower and other resources.

The free nature of resources or too low values of the expenditures, which are connected with their use, do not stimulate enterprises and associations to approach with adequate responsibility the determination of their needs for equipment, manpower and financial assets. At present the payments for resources in fact do not influence their distribution.

One of the reasons for the poor effectiveness of payments for capital is that the amount of the incentive funds is determined not according to the net profit, but according to the balance sheet profit, the amount of which is not influenced by the sizes of the payments.¹ An increase or decrease of the productive capital being put into operation and accordingly the growth or reduction of the amount of the payments in principle could influence the operation of an enterprise only when its profitability is less than the standard of payments or exceeds it negligibly. In this case the payment of the full amount of the payments either would lead to the

unprofitability of the enterprise or would cause long-term financial difficulties for the latter. This should be regarded by planning and superior economic organizations as evidence of the inefficiency of the operation of this enterprise or of the imperfection of prices and as a signal of the need to take prompt steps to correct the situation. Unfortunately, in practice the payments for capital do not have such an influence, since the enterprises planned to operate at a loss are simply exempt from the fee for capital, while lower concessionary standards of payments (usually 3 percent instead of 6 percent, and 1 percent for sovkhozes and trade enterprises) are set for enterprises with an inadequate profitability. As a result the payments for capital are not connected with the cost accounting interests of the enterprises and in fact have been withdrawn from the system of levers of the economic regulation of production. This might be justified by the fact that the increases and decreases of the amounts of productive capital depend little on the decisions made at the level of the individual enterprise. However, with the creation of major cost accounting associations the conditions for changing the situation arise, and the payments for capital can and should become an effective tool for optimizing the distribution and use of national economic resources. If the sectorial levels of prices are set with allowance made for the real capital-output ratio of production, while major cost accounting associations are given extensive rights to implement measures on the improvement of the structure of production and the development of the production base, uniform demands with respect to the effectiveness of the use of national economic resources (in particular, regardless of their sectorial membership) can perfectly well be made on them.

So that the payments for resources would become an effective lever of economic management, the fund-forming indicators should be constructed not on the basis of the balance sheet profit, but on the basis of the net profit (which has been cleared of the payments for resources), or, at least, the saving on the fee for capital should be linked with the amount of the economic stimulation funds.²

The use of the net profit in planning and stimulation instead of the balance sheet profit conforms to the use of the indicator of the production cost, which includes the payments for resources. In connection with the introduction of the production cost among the main plan indicators the inclusion of the payments for resources in the production cost of a product would substantially increase their effectiveness. The idea of payments for resources consists in the proper consideration of the public expenditures which are connected with production, since the diversion of resources for the production of a specific product from the standpoint of society is quite comparable to the expenditures of raw materials, fuel and so forth. Therefore, the inclusion of all types of payments for resources, including the interest for credit, in the production cost of a product, just like the deductions for state social insurance, theoretically is fully justified.³

In this approach the production cost is the analog not of the current production costs, but the adjusted expenditures, while the balance sheet profit coincides with the net profit.

The inclusion or exclusion of payments from the indicator of the production cost is by no means a simple play of definitions. Whether the payments for resources are among those expenditures, the reduction or increase of which is most closely connected with the interests of the enterprise, depends on this. The use of one definition or another of the production cost (and accordingly the profit) as the main indicator in the system of planning and stimulation should depend on the scale of the economic facility and on its rights and means for using the resources. Since the amounts of productive capital virtually do not depend on the activity of the individual enterprise, while its real effectiveness to a considerable extent is determined by their technical level, the rationality of the structure of the production capacities, their conformity to the plans of the output of products and other factors, which usually also depend little on it, it is not always possible to also demand of the enterprise the assurance of its standard effectiveness. Therefore it is expedient to include the production cost, which includes the fee for capital, which is calculated according to uniform national economic standards, and the net profit among the main plan indicators only for large production associations, and not the individual enterprises belonging to it. The use of the indicator of the conventional production cost and the balance sheet profit is advisable in the case of the management of enterprises on the part of associations.

One of the arguments against the inclusion of the payments for resources in the production costs is connected with the fact that an increase of the resources for the producer will be automatically reflected in the price of the product, and the increase of expenditures will be "passed on" to the consumer. The payments thereby lose their stimulating role. In our opinion, this argument is untenable. The inclusion of the payments in the production cost of a product does not at all mean the automatic change in its price. The automatic reflection of the costs in the price should be regarded as an imperfection of the pricing system. Prices should be determined not only by the outlays of the producer, but to no less an extent also by the estimation of the effectiveness of the product for the consumer. For example, with an increase of the output-capital ratio of a product without an increase of its quality the price can remain unchanged. In this case the enterprise should take into account the decline of the profit. Of course, it is necessary for the prices to cover all the production costs of normally operating enterprises, including the payments for resources, but this situation does not depend on whether the payments are included in the production cost or are taken out of the profit.

Therefore the increase of the output-capital ratio (and along with it the amount of the payments for capital) can also be the cause of an increase of the price, like an increase of any production costs. But this does not at all mean that the payments cease to have an influence on production. They affect the structure of production through the prices, stimulating a decline of the demand for expensive items and an expansion of the demand for inexpensive items (of course, on the assumption that the consumer is interested in reducing the costs).

In Bulgaria the fee for capital was repealed in 1973. The lack of a stimulating effect of this payment served as the main reason for this decision. The point is that the system of material stimulation in Bulgaria was linked with the indicators of the gross revenue⁴ and the standard production cost, neither of which depends on the amounts of the fee for capital.⁵ On the theoretical level this circumstance should serve as evidence not of the lack of the need for a fee for capital, but of the need to shift from the indicator of the gross revenue to the indicator of the revenue which has been "cleared" of the payments for material resources.

The decision to repeal in the future the fee for productive capital has also been made in Hungary. However, there this decision is connected with the more general aim at the sharp reduction, and then the complete halt of the nonreturnable financing of economic operations on the part of the state. The equalization of the position of enterprises with respect to the objective conditions of their activity, which do not depend on the labor efforts of their collectives and the effectiveness of their economic management, is one of the important functions of the fee for resources. According to this principle, it is necessary to differentiate the fixed and the working capital, which are formed by means of 1) internal and borrowed assets and 2) nonreturnable financing on the part of the state. Here only the latter should be liable to payments. Since in Hungary the productive capital will be created almost exclusively by means of the internal and borrowed assets of enterprises, the fee for capital to a considerable extent loses its economic importance.

With respect to the amount of the payments for resources it should also be admitted that it is understated. At present the fixed (rent) payments play a negligible role in the distribution of the profit: in 1977 2.3 billion rubles of the 78.4 billion rubles of total payments from the profit to the budget.⁶ This can be explained by the complexity and lack of elaboration of the problem of the valuation of natural resources. But even the payments for productive capital at present are on the average only 1.4 percent of the total value of the fixed and working capital (25.4 billion rubles out of 1,792,000,000,000 rubles),⁷ while the basic standard of the fee is 6 percent.

The effectiveness of other economic levers, namely the interest for credit and the standard of efficiency, which is used in planning calculations, is also declining. There serve as the reasons for this: 1) the lack of interest in loan capital of those enterprises, which have an opportunity to obtain nonreturnable financial capital from the state; 2) the limitedness of loan capital for noncentralized investments regardless of their effectiveness; 3) interest rates which have been set too low; 4) numerous violations of the economic criteria of the choice of projects in the planning of capital investments (the allocation of assets for the building of projects with an efficiency less than the standard efficiency and the rejection of the realization of highly efficient plans).

The assumption is being advanced⁸ that at least in a number of regions and sectors, where a considerable shortage of manpower is observed, the monetary and financial expenditures of enterprises in the case of an increase of the number of personnel (that is, wages and the deductions for social insurance) are low as compared with the real gain of the enterprise from the recruitment of additional manpower resources. In this connection it is proposed to increase the deductions for social insurance and to introduce payments for the use of skilled manpower. The appropriate valuation of the manpower resources should be taken into account when selecting the versions of the capital investments according to the minimum adjusted expenditures and when establishing the sectorial standards of profitability in pricing.

In some sectorial methods of determining the economic effectiveness of capital investments when comparing the versions of construction in new regions it is recommended to include in the amount of the adjusted expenditures the additional expenditures on the recruitment of manpower, including the capital investments and annual outlays on the creation of the social infrastructure and the expenditures on the transfer of workers and their families.⁹ According to the temporary method, which has been adopted in the coal industry,¹⁰ all the expenditures, payments and benefits from the public consumption funds to the workers of the given project are included in the amount of the adjusted expenditures. The inclusion of the entire amount of the benefits and payments from the public consumption funds in the valuation of manpower resources is illegitimate.¹¹ At the same time the inclusion in this valuation of all the benefits and advantages, which the workers of the given sector receive by means of departmental expenditures, is completely justified. The level in different sectors fluctuates very significantly.

In economic practice differences are noted between the amount of the standard of the fee for capital and the interest for credit, on the one hand, and the standards of the economic effectiveness of the capital investments, which are used in the planning calculations, on the other. The latter are differentiated by sectors, and their amounts range from 10 to 30 percent and more, which greatly exceeds even the official standard of the fee for fixed production capital (6 percent).

There is no unity of opinions among economists on the question of the dependence of the standards of the payments for capital and the effectiveness of capital investments. The questions of the determination and use of the standard of effectiveness, the base of the calculation of the payments for capital (the basic or depreciated cost) and so on are also debatable. The quantitative evaluations of the uniform national economic indicator of the effectiveness of capital investments, which range from 6 to 25 percent, also arouse disagreements. The reliable quantitative determination of this standard is one of the most difficult economic statistics problems, which so far has not received an unequivocal solution. A number of disagreements on the indicated questions are undoubtedly connected with the interpretation of the corresponding concepts and categories, as well as with the diversity of the indicators, by which the amount of the resource and the impact from its use can be measured.

The annual impact of a unit of similar resources theoretically should be measured on the scale of the national economy by the increase of the end product or the national income by means of the possibility of using during the year an additional unit of these resources (or accordingly their decrease by means of the removal of a unit of the resources from use), while at the level of the individual enterprise it should be measured by the increase of its profit. It is possible to use the additional unit of the given resource and the amount of other resources, which is necessary for its use, in different ways. Therefore the cited formulation is ambiguous. It is possible to give it a clear meaning by assuming that either statistically averaged values or the optimum means of using the resources, that is, a model of optimum planning, are meant. Since the standard of effectiveness is intended for the optimization of economic decisions, in determining it one should proceed from the model of optimum planning, for which dual evaluations, that is, models of linear or convex programming, have been determined.

Within such a model the effectiveness of a marginal unit of a uniform resource depends on its available amount. It decreases with an increase of the amount of this resource (for example, the limit of capital investments), since first of all the most effective means of its use (for example, the most efficient projects are included in the plan), and then less and less effective means are implemented. The magnitude of the effectiveness of the marginal unit of a uniform resource with this amount of it, which is called the standard of the effectiveness of a resource, is of basic importance for the choice of the optimum versions.

These general principles should be borne in mind first of all when choosing the optimum versions of the use of capital investments, as well as for the evaluation of the standard effectiveness of the fixed and working capital as the results of these investments.

The marginal effectiveness of an additional unit of capital investments can be interpreted as the possibility of obtaining an additional result from the implementation of marginal versions of investments a year earlier than the planned date. It emerges due to the decrease with time of the optimum valuations or the adjusted prices. From this it follows that the standard of the annual effectiveness of capital investments and in general of the owed financial resources should coincide with the magnitude of the interest for credit.

The task of choosing specific versions of capital investments is a micro-economic task in contrast to the tasks and questions, which are connected with the determination and forecasting of the rate of economic growth and the overall national economic proportions, with the study of which macroeconomics is concerned. A system of production functions, which in principle makes it possible also to determine the standards of the effectiveness of capital investments and productive capital, is frequently used in macroeconomic studies.¹² With reference to our analysis we will group the models for the choice of the versions of production development at the

level of sectors and individual enterprises and even territorial production complexes with the microeconomic models. The semantic and quantitative definition and use of the standards of the effectiveness of resources in macro- and microeconomic studies and models are different. On the micro-level they should be used as a tool of the economic mechanism in the form of interest for credit, payments for productive capital and for the use of manpower resources, rent payments for natural resources and so on, in macroeconomic calculations they should be used mainly for forecasts.

In economic mathematical models the deviation of the effectiveness of capital investments from the standard value is manifested as the effect of non-linearity. From the standpoint of the management mechanism it is not the formal mathematical interpretation, but the economic interpretation of the deviations of the effectiveness of specific versions of investments from the standard, which is important. The possibility of obtaining a greater effectiveness as compared with the standard effectiveness may arise due to the especially favorable conditions, under which the given version is realized.

In part these conditions are created by the natural resources (fertile land, rich deposits of minerals), sites for construction with a convenient location and so forth, the value of which should be included in the amount of the capital investments, while the corresponding portion of the effect of these investments will be interpreted as the rent component. But a significant portion of the excess of the effect over the standard value usually cannot be connected with limited resources. Since we are interested first of all in the questions of economic management and the stimulation of production, the elaboration of new scientific, technical and design decisions can be regarded as a part of the process of making capital investments, while the expenditures connected with them can be regarded as a part of the total capital outlays. Then the excess of the real effectiveness of the capital investments over the marginal effectiveness should, at least in part, be attributed to the effect of economic management and planning and be included in the net profit.¹³

It is hardly possible to give an unequivocal answer to the question, precisely what portion of the effect should be considered to be directly the result of the allocation of capital assets, and what portion should be considered the effect of economic management, since, as a rule, both the allocation of capital investments and the gained experience of management are equally necessary conditions for the realization of new economic potentials.

The problem of the quantitative separation of the effect, which is connected with the increase of the amount of capital investments, from the effect of economic management and technical progress on the basis of statistical data is all the more far from always solvable. When elaborating models of economic growth on the basis of production functions this problem is usually interpreted as the acceptance of the hypothesis of embodied technical progress or the hypothesis of autonomous technical progress,¹⁴ and the unequivocal evaluation of the acceptability of either hypothesis

is apparently impossible. In the former case it is assumed that the effect of technical progress cannot be manifested without additional capital investments, that it is inseparable from the effectiveness of new productive capital and, on the other hand, that any possible increase of capital investments, being realized in new technical forms, already in itself yields a great effect, which reflects the present level of technology, organization and economic management. The hypothesis of autonomous technical progress, on the contrary, postulates an independent influence of the amounts of resources being used and the improvement of technology on production efficiency.

In the case of the hypothesis of embodied technical progress the operating fixed capital should, obviously, be quickly depreciated by means of obsolescence, so that the total real value of the capital is much less than its amount which is taken into account at the initial value. But the effectiveness of new capital (for a unit of the capital, which is taken into account at the replacement value) should be much greater than in the case of the hypothesis of autonomous technical progress.

According to estimates,¹⁵ the values of the standard of effectiveness of capital, according to these two hypotheses, for France differ by a factor of 1.5 (10 and 15 percent). In other words, the method of evaluating the degree of obsolescence and wear can have a strong influence on the result of the estimates. This circumstance, in particular, can explain in part the frequently expressed claim that the effectiveness of capital investments exceeds greatly (for example, by several times) the effectiveness of already created productive capital. From the point of view of the theory of optimum planning this is a paradox, since the value of the new capital coincides with the capital assets spent on its creation, while the decrease of the effectiveness of the capital in the process of operation in principle should be offset by high amortization deductions and should be reflected in the decrease of its valuation (if the capital is measured by the depreciated cost).¹⁶

Obviously, the gap between the effectiveness of capital investments (new capital) and old capital can arise as a result of the understatement of the standards of the amortization deductions in sectors with rapid technical progress, as well as of the proportionality of these standards and the initial value of the capital, disregarding the decrease of its real effectiveness. Such a system of amortization deductions leads for new capital to the overstatement of the cost accounting effectiveness, and for old capital to its understatement. Understated standards of amortization deductions can serve as one of the causes of the intersectorial differentiation of the standard of not only the absolute, but also the comparative effectiveness, namely a higher standard of effectiveness in the sectors with rapid technical progress and accordingly with a high rate of obsolescence of the equipment.

As was noted above, the average effectiveness of capital investments even with their optimum use should be greater than the standard (marginal)

effectiveness. Although with an increase of the amount of capital investments its marginal effectiveness should decrease, since the most favorable opportunities of their use are exhausted, with time new opportunities are afforded by means of scientific and technical progress, the expansion of the scale of production and, what is important to emphasize, the realization of these opportunities by the workers of the system of planning and management of the economy. Since the means of seeking new technological methods, new commercial contacts, new methods of the management of economic processes, finally, along with the emergence of new needs in society in principle are unlimited, there are no grounds to believe that given the efficient use of capital investments all the "supereffective" versions with time will be exhausted and the average effectiveness will coincide with the marginal effectiveness.

The considerable spread of the effectiveness of various means of using capital investments appears very clearly with the ordering of the set of specific means of investment in sectors according to their proportionate effectiveness (the increase of the profit per ruble of investments) and then the construction of the dependence of this effectiveness as a function of the sum of the capital investments for the realization of all the means, which are more effective than the given means.

It should be noted that the corresponding curves for decentralized capital investments usually differ sharply from the curves of centralized capital investments by a much higher level of effectiveness and by more fractional amounts of investments. The dependences of the effectiveness of capital investments in the sectors of petroleum machine building during 1971-1975 are shown in Figures 1 and 2.¹⁷ They demonstrate the comparative stability of the type and dimensions of the corresponding curves, that is, the realization from year to year of highly effective opportunities of investments (with an effectiveness of 200-300 percent). The marginal effectiveness here fluctuates over the range of 30-35 percent, while the average effectiveness is about 150 percent. The centralized investments during the five-year period had an effectiveness over the range of 13.8 to 44 percent with an average effectiveness of 22 percent. A considerable dependence of the effectiveness on the amount of capital investments is also revealed in the variant calculations in the optimization problems. The dependences of the total production cost of the fixed (set) amount of output with a change in the amount of capital investments, which were obtained in the calculations according to the models of the optimum plan of the development of the production of electric motors at the Informelektro Institute, are cited in Figures 3 and 4.¹⁸

From these dependences it follows that with an increase of the amount of capital investments in excess of the necessary minimum the additional economy in the production cost exceeds by two- to threefold the increase of the capital investments, and then decreases to zero, the production cost subsequently remains constant.

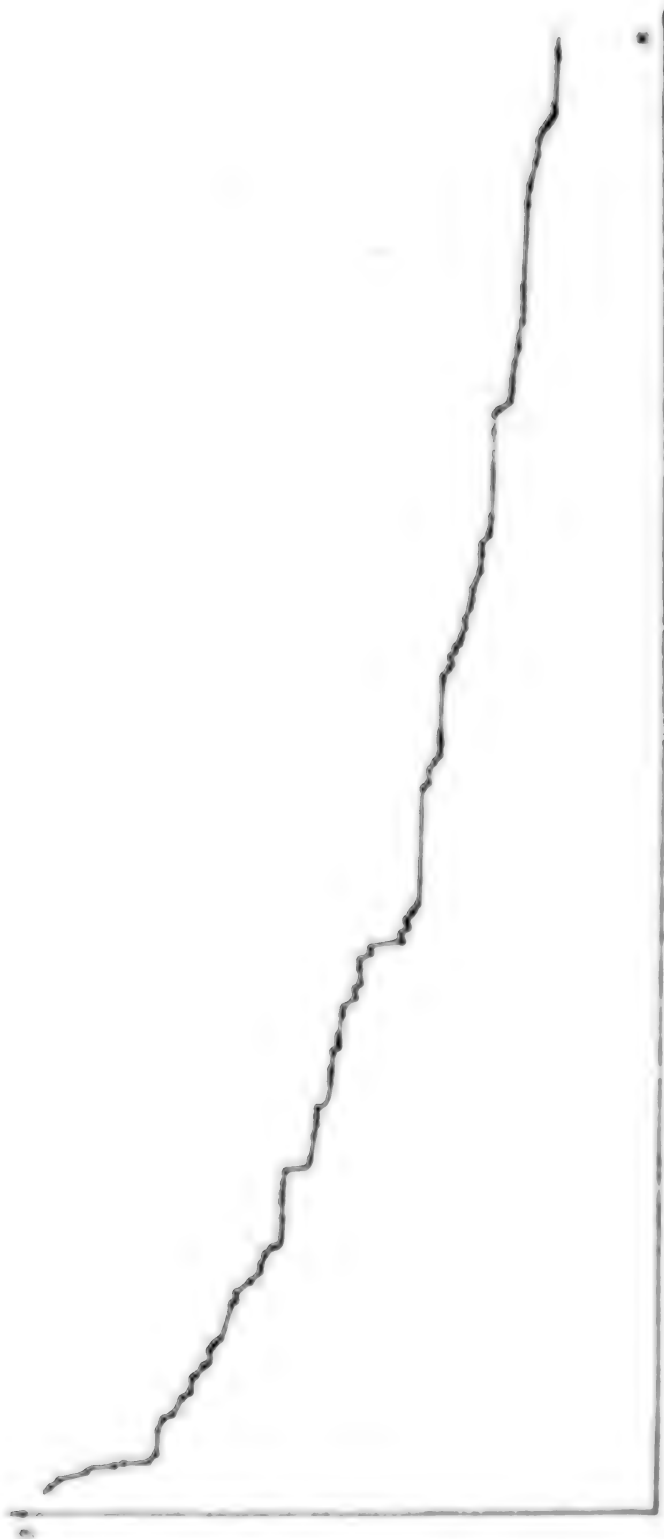


Figure 1. Dependence of the Effectiveness of the Versions of Capital Investments, Which Were Made During 1976-1975, on the Overall Limit of Investments During the Entire Period

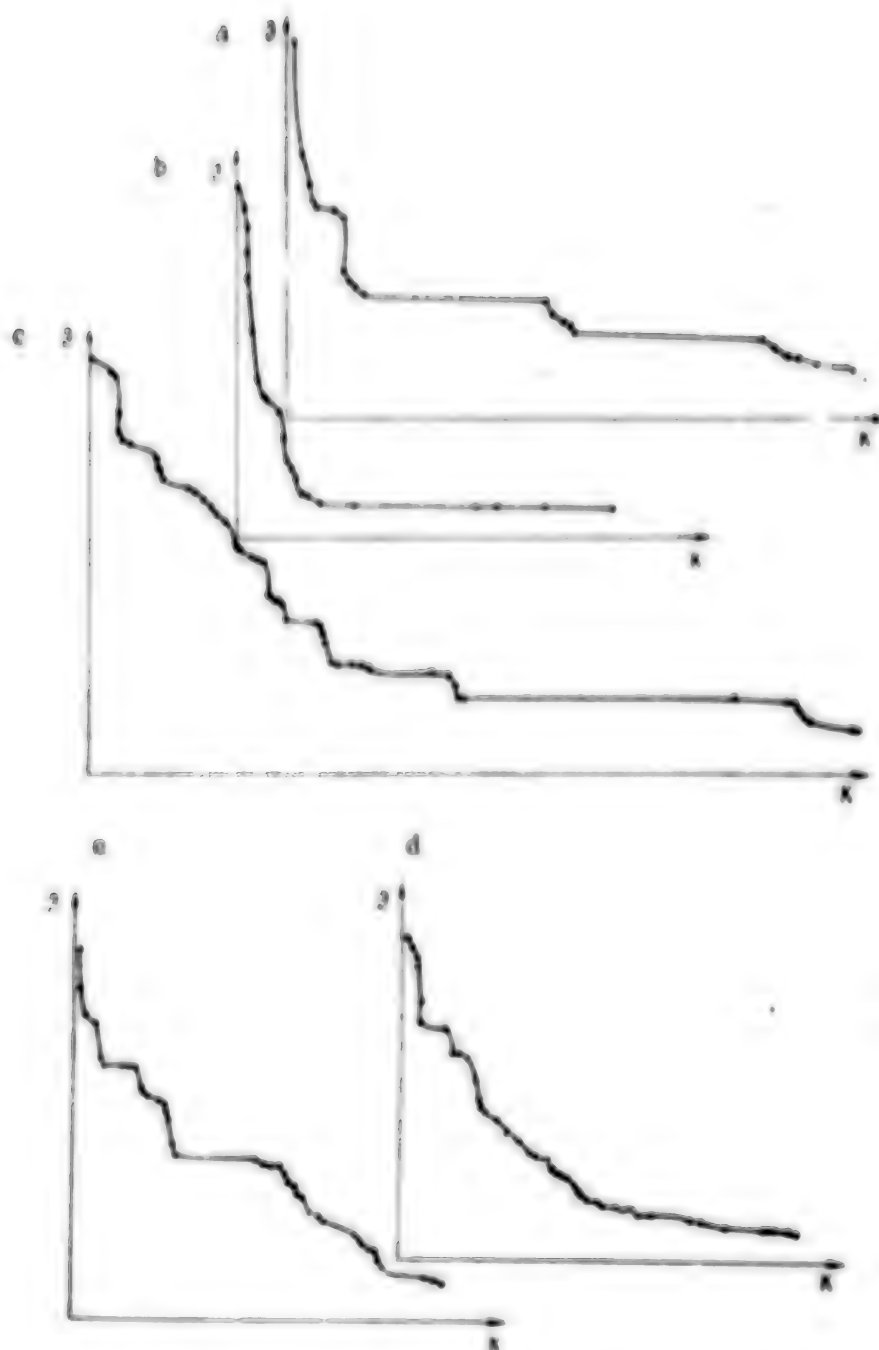


Figure 2. Dependence of the Effectiveness of the Versions of Capital Investments, Which Were Made During the Individual Years of the Period 1971-1975, on the Total Limit of Investments for the Corresponding Year

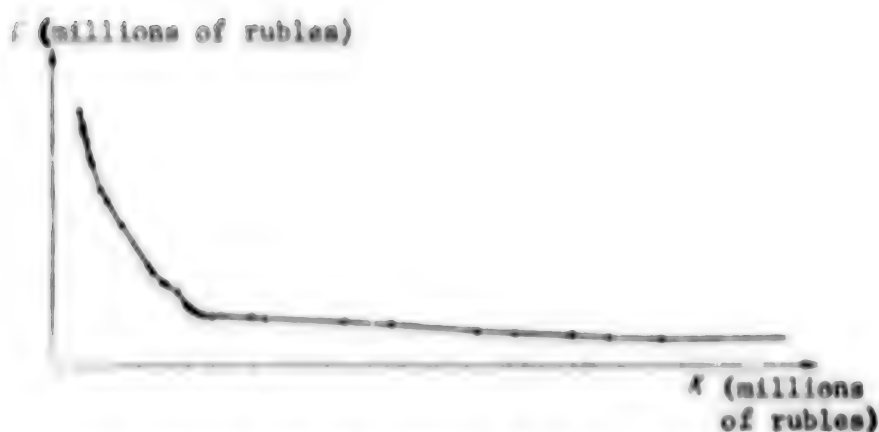


Figure 3. Dependence Between the Production Cost and Capital Investments (Production of Motors up to 100 kW)

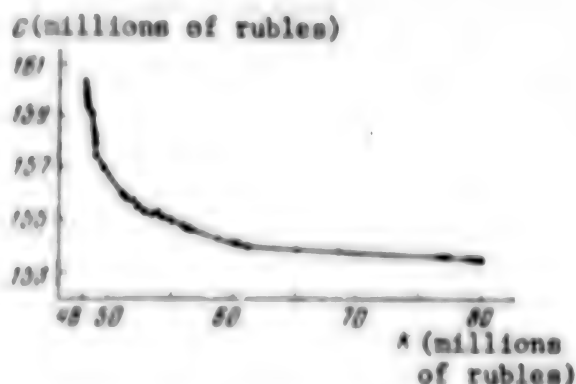


Figure 4. Dependence Between the Production Cost and Capital Investments (Production of Miniature Motors)

In the cement industry the dependence of the proportionate production cost on the limit of capital investments¹⁹ had, at first glance, a different nature. After a sharp decrease to a specific level with the subsequent increase of the limit of capital investments it remained practically constant. But this case does not contradict the general rule on the considerable dependence of the national economic effectiveness on the limit of capital investments, since the effect took the form not of a decrease of the production outlays, but of the bringing of the plants closer to the consumers of the cement and the reduction of transportation costs.

Let us note that the construction by certain methods or others of paired dependences between the main characteristics of the national economy and especially individual sectors can be in itself an important tool of the improvement of the plans, particularly the elimination of the imbalance of the resources of labor and capital investments and so forth. The simplest mode has been proposed for the elimination of the imbalance between the

availability of and the demand for resources of labor and capital investments on the basis of the partial derivatives of the demand for these resources according to the output volume and the standard of effectiveness of capital investments (the latter is regarded as the regulator of the minimum effectiveness of the versions being implemented and thereby also as the regulator of the marginal capital-output and labor-output ratios of production).²⁰

The recognition that a considerable share of the national income is indebted for its origin to the effect of planning and economic management, makes it incumbent to review the interrelations between the standards of the effectiveness of manpower and capital resources, which were derived from the models of linear programming. As is known, an equality of the expenditures and results (if the magnitudes of the effectiveness of the used resources, which were calculated according to their standards, are included in the total expenditures) is observed in the model of linear programming. Since the model of linear programming is adequate for a very wide range of economic situations, the principle of the equality of the expenditures and results is frequently used by economists as having universal importance. According to this principle, the gross income, or the net production of an economic subdivision, for example, a sector, is equal to the sum of the effectivenesses of the material and manpower resources used by it. This notion, in particular, was used in the method of calculating the standard price levels on the basis of the intersectorial balance (the prices of production and their modifications).²¹ If we abstract ourselves from the valuation of natural resources, the national income I is regarded as the sum of the effectivenesses of the manpower resources engaged in the sphere of physical production L and the productive capital C , which is taken into account in accordance with its standards E_L and E_C :

$$I = E_L L + E_C C.$$

It is proposed to use these uniform standards for the calculation of the standard amounts of net production in sectors. According to the equation, the valuations of the manpower and capital resources-- E_L and E_C --are in an inverse dependence, so that the increase, for example, of the standard of E_L should automatically entail a decrease of the standard of E_C or an increase of the overall level of prices. This consideration is used at times, in particular, as an argument against the introduction of payments for manpower resources and the consideration of the increased standard of their effectiveness in the selection of the versions of capital investments by those economists, who support a high standard of the effectiveness of capital investments. Stable sharp differences in the profitability of different sectors in the case of both centralized and market mechanisms of management, as well as the curves of the decrease of the effectiveness of plans and measures, which are renewed quite steadily from year to year, with an increase of the overall amount of capital investments in the development of a sector apparently attest that the effect of the "measurable" resources--manpower and material--far from exhausts the total net production and the national income. If this is admitted, it should also be admitted that the increase of the standards of E_L and E_C can occur simultaneously without an

increase of prices by means of the decrease of the difference between the price and the total amount of the outlays (which includes the effectiveness of the resources). It should be noted that precisely the direct, and not the inverse dependence between the valuations of E_L and E_C is more natural than the dependence between the valuations of any interchangeable resources. The mechanism of this relationship is as follows. The increase of the valuation of manpower resources E_L should displace the choice of the versions of capital investments in the direction of less labor-consuming and, consequently, more capital-intensive versions, which in turn will cause an increase of the need for capital investments. With an invariable total amount of capital investments its balance with the need for the expansion of production can be ensured only on the condition of the increase of the standard of the effectiveness of capital investments.

When market and credit mechanisms are the basis for the distribution of resources, the statistical data on wages (before taxes) and bank interest are usually used for evaluating the effectiveness of manpower and financial resources. In a planned economy problems, which so far have not yielded to a reliable statistical solution, arise in the valuation of natural resources and the determination of the standards of the effectiveness of productive capital and capital investments.

The statistical evaluation of the standards of the effectiveness of productive capital or capital investments and manpower resources is complicated by the following factors:

the sectorial levels of prices (more precisely, the levels of profitability) are not always dictated by economic factors. Therefore even the standards of the comparative effectiveness of capital investments, which are used in planning practice, differ sharply in different sectors;

the actual effectiveness of manpower resources in a number of sectors and regions does not conform to the additional expenditures of wages, which an enterprise makes when increasing the number of its personnel;

the methods and standards of the consideration of the retirement, wear and obsolescence of fixed production capital also introduce the element of conditionality in the determination of the economic efficiency.²²

As was already indicated, the standards of the effectiveness of resources, which were obtained on the basis of the production function, can be used in macroeconomic calculations. Let us regard the simplest production function as the dependence of the national income (or the end product) I on the amount of productive capital (only the fixed capital is usually taken) C , the manpower resources (usually the number of those employed in the sphere of physical production) L and time t (which is calculated from the start of the base period), that is,

$$I = f(C, L, t).$$

In the case of a statistical definition this function is regarded as a regression function. The data for different years or for different production facilities, projects, technological methods and so forth are used as points for the identification of the parameters. In all these cases the facilities, projects and so on are not ranked according to the effectiveness, self-contained facilities are not distinguished. Therefore, although the derivatives (in our case $\partial f/\partial C$ and $\partial f/\partial L$) act formally as the standards of effectiveness, these values are not marginal in the sense which economic (more precisely, microeconomic) theory incorporates in these concept. Marginal economic indicators in principle cannot be obtained on the basis of such regression functions. Accordingly in such a direction it is impossible to detect the effect of management, since this factor cannot be connected with any independent variable in the regression function. Therefore certain apriori hypotheses, which do not have a statistical basis, about the increase of the effect of scientific and technical progress as a function of time (usually as exponents) are usually used when constructing the production function. The evaluations of the effectiveness of the resources $\partial f/\partial C$ and $\partial f/\partial L$ depend strongly on the apriori adopted type of function $f(C, L, t)$. Owing to this the magnitude of the standard part of the national income $I_g = (\partial f/\partial C)C + (\partial f/\partial L)L$, which is obtained from the production function, is not dependent on the increase of the effect of scientific and technical progress and often is equal or even greater than the national income itself, that is, $I_g \geq I$.

What has been said makes it necessary to reject the production function as a means of obtaining the marginal standards of effectiveness. Obviously, the values of these standards can be obtained only if the standards will be used directly in the distribution of the corresponding resources (in the real practice of management as elements of the credit and financial mechanism or if only in planning estimates, which in one way or another imitate the real mechanism).

The question remains: what economic meaning do the standards like $\partial f/\partial C$ or $\partial f/\partial L$, which were obtained from the production function, have, and can they be used for the improvement of the distribution of resources? From the concept adopted above it follows that these standards, which reflect the average, and not the marginal values of effectiveness, can be regarded as standards which not only include the effect of the use of material and manpower resources proper, but also contain in part the effect of economic management and scientific and technical progress. This accords with the fact that the standards, which are obtained from the production functions, as a rule, lead to the economically meaningless inequality $I_g > I$.

Although the question of the shift from the macroeconomic characteristics $\partial I/\partial C$, which are obtained on the basis of regression functions like the production functions, to microeconomic standards remains open, their practical use by the highest level of economic management can be quite productive. It is based on the hypothesis of embodied technical progress and the "embodied effect of management." But the decrease of the effectiveness of capital investments with an increase of their amounts attests that this

hypothesis remains adequate only in the case of small changes in the amounts of the redistribution of resources. Therefore only the directions of the redistribution of resources, which increases the effectiveness, can be obtained by means of regression functions like the production functions, while the conclusions arrived at during the calculations should be regarded only as hypotheses, only as "material for further analysis," since the quantitative correlations obtained by this means do not reflect the decrease of the effectiveness of capital investments with an increase of their amount and are valid only in a certain small vicinity of the array of data which were used for the identification of the parameters of the regression.

FOOTNOTES

1. See in more detail on this P. G. Bunin, "Payments for Material, Financial and Natural Resources in the System of Management of Socialist Social Production," *EKONOMIKA I MATEMATICHESKIYE METODY*, Vol 12, No 6, 1976, p 1061.
2. *Ibid.*, p 1061.
3. The production cost is calculated in this way in Hungary. It should be noted that in the USSR at one time the interest on loans was taken into account in the production cost, and this procedure was abolished only in 1963.
4. The amount of the gross income is defined as the difference between the receipts from sale (excluding the turnover tax) and the material expenditures.
5. "Khozyaystvennyy raschet v sotsialisticheskoy ekonomike" /Cost Accounting in the Socialist Economy/, Moscow, "Mysl", 1976, pp 111-112.
6. "Narodnoye khozyaystvo SSSR v 1977 g." /The USSR National Economy in 1977/, Moscow, "Statistika", 1978, p 559.
7. *Ibid.*, pp 559, 40, 547.
8. V. A. Valkonskiy, N. V. Pavlov, V. B. Tkach, "On the Effectiveness of Manpower Resources and the Payments for Their Use," *EKONOMIKA I MATEMATICHESKIYE METODY*, Vol 14, No 2, 1978.
9. "Vremennyye ukazaniya po opredeleniyu ekonomicheskoy effektivnosti kapital'nykh vlozheniy pri proyektirovaniya gidroenergeticheskikh ob'ektov" /Temporary Instructions on the Determination of the Economic Efficiency of Capital Investments in the Designing of Water Power Projects/, Moscow, 1978, USSR Ministry of Power and Electrification, USSR Main Administration of Scientific Research and Design Organizations.

10. "Metodika otsenki ekonomicheskoy effektivnosti ispol'zovaniya proizvodstvennykh resursov proyektiruyemyimi ugledobyvayushchimi predpriyatiyami (vremennaya)" /The Method of Evaluating the Economic Efficiency of the Use of Production Resources by Coal Mining Enterprises, Which Are Being Planned (Temporary)/, Moscow, 1977, USSR Ministry of the Coal Industry, Main Administration for the Design of Coal and Shale Industry Enterprises.
 11. See V. A. Volkonskiy, N. V. Pavlov, V. B. Tkach, Op. cit.
 12. See (L. Stoleryu), "Ravnovesiye i ekonomicheskiy rost (printsipy makro-ekonomicheskogo analiza)" /Equilibrium and Economic Growth (Principles of Macroeconomic Analysis)/, Moscow, "Statistika", 1974; L. V. Kantorovich, A. L. Vaynshteyn, "On the Calculation of the Standard of Effectiveness on the Basis of a Single-Product Model of the Economy," EKONOMIKA I MATEMATICHESKIYE METODY, Vol 3, No 5, 1967.
 13. See V. A. Volkonskiy, "Problems of the Determination of Sectorial Price Levels," EKONOMIKA I MATEMATICHESKIYE METODY, Vol 12, No 1, 1977, pp 111-112.
 14. See (L. Stoleryu), Op. cit., pp 325-328, 374-378.
 15. Ibid., p 401.
 16. See V. A. Volkonskiy, "The Relationship of the Effectiveness of Productive Capital and Capital Investments," EKONOMIKA I MATEMATICHESKIYE METODY, No 1, 1980.
 17. The dependences were constructed by M. I. Belkin.
 18. The dependences were obtained by Yu. Rudnev.
 19. The dependence was constructed in accordance with the results of variant calculations according to the model of the optimum development and location of cement production, which was developed by the State All-Union Scientific Research Institute of the Cement Industry jointly with the Main Computer Center of USSR Gosplan under the direction of A. N. Losev.
 20. See V. O. Chernyavskiy, "Voprosy effektivnosti i optimal'nosti" /Questions of Effectiveness and Optimality/, Moscow, "Nauka", 1977.
 21. See V. D. Belkin, "Tsena yedinogo urovnya i ekonomicheskiye izmereniya na ikh osnove" /Prices of a Uniform Level and Economic Measurements on Their Basis/, Moscow, Ekonomizdat, 1963.
 22. See V. A. Volkonskiy, "The Relationship of the Effectiveness of Productive Capital and Capital Investments," EKONOMIKA I MATEMATICHESKIYE METODY, No 1, 1980.
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INVESTMENT, PRICES, BUDGET AND FINANCE

ALL-UNION CONFERENCE ON PRICES HIGHLIGHTED

Moscow PLANOVYE KHOZYAYSTVO In Russian No 6 Jun 80 pp 115-118

/Article by Yu. Biryukov and S. Kurdyukov: "All-Union Conference on Price Setting Matters"7

/Text7 In April 1980, an all-union conference on price-setting matters was held in Moscow. Participating in the conference were Secretary of the CPSU Central Committee V.I. Dolgikh, Deputy Chairman of the USSR Council of Ministers T. Ya. Kiselev, Deputy Chairman of the All-Union Central Trade Union Council V.I. Prokhorov, deputy chairmen of the RSFSR Council of Ministers V.P. Orlov and N.I. Maslennikov, USSR and RSFSR ministers, responsible workers from the CPSU Central Committee and the USSR Council of Ministers, the central committees of the Party organizations and councils of ministers of the union republics, the central ministries and departments, price setting organs, the managers of industrial enterprises and scientists and economists.

The Chairman of the USSR State Committee on Prices N.I. Glushkov gave a report on the progress of work and the tasks for further improving planning price setting in accordance with the Decree of the CPSU Central Committee and USSR Council of Ministers that was issued on 12 July 1979.

In his speech Chairman Glushkov noted that in the system of measures directed at strengthening the influence of the economic mechanism upon raising the efficiency of production and the quality of work, considerable attention is being given to improving wholesale prices for industrial and agricultural product and the rates for shipments of goods without changing state retail prices. The solution of these problems requires that work be improved in the field of price setting. It is necessary to strengthen the role of wholesale prices and rates for stimulating scientific-technical progress, the strictest conservation of fuel and energy resources, ferrous and nonferrous metals, raw materials and materials, for raising the

quality of product and expanding the assortment of consumer goods in accordance with the needs of the population. It is important to correctly solve pricing problems for the output of the agrarian-industrial complex in light of the Decree of the July (1978) Plenum of the CPSU Central Committee. N.I. Glushkov emphasized that the task of the All-union conference is to analyze the work in price setting in the national economy, which will make it possible to plan ways to improve it further. *

The report was discussed by 96 conference participants, including the Minister of Instrument Making, Automation Equipment and Control Systems K.N. Rudnev, academicians N.P. Feorenko and L.V. Kantorovich, Deputy Chairman of USSR Gosplan A.V. Bachurin, Deputy Minister of the Coal Industry G.I. Nuzhdikhin, General Director of the Scientific-Production Association KRIUGENMASH V.P. Belyakov, Chief of the Planning and Economic Administration of the Ministry of Heavy and Transport Machine Building L.A. Busyatskaya, Chairman of the RSFSR State Committee on Prices K.I. Frolov, First Deputy Minister of Machine Building for Light and Food Industry and Household Appliances A.M. Yershov, Minister of the RSFSR Textile Industry A.M. Paramonov, Director of the Institute of Economics of Nonferrous Metallurgy N.F. Sklokin, First Deputy Chairman of the USSR State Committee for the Supply of Production Equipment for Agriculture V.M. Shvyd'ko, Deputy Chairman of the USSR State Committee for Standards V.V. Tkachenko, General Director of the Production Association Krasnyy proletarij O.A. Korolev, Chairman of the Chuvash ASSR State Committee on Prices N.Ya. Yakovlev, Vice-President of the USSR Academy of Sciences I.I. Lukonov, Director of the Cherepovets Metallurgical Combine M.G. Anan'evskiy, Director of the Scientific-Research Institute on Prices Yu. V. Borozdin, Director of the Ivanovo Machine Tool Building Production Association imeni Fiftieth Year of the USSR V.P. KabaIdze, Chairman of the State Commission for Stockpiling Useful Minerals, USSR, A.M. Vybochkin, Chairman of the Moldavian SSR State Committee on Prices V.G. Kutyarkin, Chairman of the Ukrainian SSR State Committee on Prices V.K. Shamborskiy, First Deputy Minister of the Construction Materials Industry A.S. Boldyrev and Deputy Director of the Production Association Ekibastuzugol' U. K. Kasymzhanov.

The conference materials are being prepared for publication. This article presents only a small part of the proposals and recommendations.

* The basic premises of the report are outlined in N. Glushkov's article "Concerning the Further Improving of Planning Pricesetting and its Influence upon Raising Production Efficiency and the Quality of Work", which is published in this issue.

The Minister of Instrument Making, Automation Equipment and Control Systems K.N. Rudnev noted that improving price setting occupies an important place in the system of measures for restructuring the economic mechanism. Since 1970 the instrument making sector has been working on a full cost accounting basis. The expanded reproduction, including capital construction, technical reoutfitting and the financing of scientific-research and design work are accomplished through the sector's own means. Within the state plan there is a direct dependency of the sector's development upon its current activity. For this reason the drawing up of a scientifically sound system of price setting and the correct determination of not only the future level of expenditures for product output, but also the establishing of a strict economically estimated standard of profitability, is important to us. The pledge of the sector's steady work is that the accepted standard of profitability correspond to the amount of planned profit and promote the updating of product and the assimilation of new technology.

K.N. Rudnev emphasized that one cannot agree that for all sectors profitability must be accepted at one level as the basis for estimating price without taking the output-capital ratio into consideration. With this approach (with a comparable volume of production) the sectors, in which the cost of production funds is relatively low, will have a standard profit that is significantly lower than sectors having a high cost of funds.

For the successful realization of the system of measures for improving planning it is extremely important to ensure, on the one hand, price stability for the planning period, and, on the other hand, a balance of plan indicators with established prices.

It seems to be somewhat unwise to require that a large number of standardizing-technical documentation and various additional interpretations be sent to the organs that establish prices. The process of devising, coordinating and approving prices must be simplified and speeded up.

K.N. Rudnev also discussed the use of the normative net product (NCHP) indicator in planning. The problem of production equal advantageousness, which is characteristic for the commodity production indicator in comparable prices, is also found in planning using the normative net product indicator. Because of the large percentage of profit in the normative net product indicator as compared with price, the problem is even more acute.

Academician N.P. Fedorenko noted in his speech that the methodology for planning prices is one of the key areas of research in Soviet economic science. In any sphere of economic activity and at any level of management the commensuration of expenditures and results is a necessary condition for making scientifically sound economic decisions.

While emphasizing the significance of the problem of measuring expenditures and results in a planned economy, V.I. Lenin advanced the well known formula: "Socialism is accounting." Price is the most important tool in solving this problem. If we learn to comprehensively measure actual outlay and the efficiency of using all production resources - funds, labor, natural riches and scientific-technical information - we will solve the problems of motivation, efficiency and quality.

N.P. Fedorenko also dwelt on the problem of basing prices for the new output of a production-technical purpose. After noting the existing shortcomings, he formulated the following ways to solve the problem: first, it is necessary that the system of prices motivate the producer to lower expenditures for the production of new equipment, for which one must reject the practice of limiting that portion of the price that is connected with the economic savings; second, it is necessary to increase the accuracy of estimating the upper range of the price and the economic savings, that are considered in prices for new equipment; and third, the prices for new equipment must provide a maximum economic gain from its production. In this connection it is necessary to more extensively adopt methods for determining the prices of plan overall balance, which provide for the organic coordination of the production and product distribution plans.

The realization of these trends calls for accounting in the practice of price setting of several specific economic indicators and standards. N.P. Fedorenko recommended rejecting methods for basing full expenditures for the production of new equipment that are based essentially on the average production cost for the sector. The basis for their estimation must be a unified principle, in accordance with which standard profit will be determined in proportion to the relative output-capital ratio of production with a standard of effectiveness of capital investments that is unified throughout the national economy.

N.P. Fedorenko also touched upon accounting for the natural factor in price setting and the "price per unit of useful effect" indicator and the need to devise global and long-term concepts for the development of the planned prices system.

The general director of the Scientific-Production Association Kriogenmash, V.P. Belyakov devoted most of his attention to planning, price setting and stimulating the production of new equipment within scientific-production associations. At present the planning and evaluation of a scientific-production association's activity are based on indicators that exist for production associations (production volume and product sales, profit, labor productivity, and percentage of product bearing the Mark of Quality). This practice encourages the production associations to manufacture on a series basis to the detriment of developing and assimilating new technology.

The system of price setting for the product that is produced by the Scientific Production Association must be structured on other principles.

The USSR State Committee on Prices and the USSR State Committee for Standards have established a procedure for simultaneously devising and adopting normative technical documentation and prices. Systems of limited prices have been introduced into economic practice, which serve as a guide when determining the efficiency of scientific-technical solutions that have been taken at the stage of planning new manufactured articles. Informational charts, in which the upper prices, limited price, the planned price, the economic savings, the incentive markup to the price and other indicators are fixed, are compiled at the stage of drawing up the technical plan. However, when coordinating the price with the customer an estimate is used that is based upon the determination of the production cost and the normative profitability, rather than the profitability that the enterprise achieved. V.P. Belyakov believes that the price for a manufactured article should be established according to an agreement between the manufacturer and the customer in a range between the limited price and the lower level depending upon the economic savings to the national economy from the adoption of the manufactured articles, without limiting profitability.

The present procedure for coordinating and approving prices for manufactured articles that are manufactured according to custom (one-time) orders is unjustifiably complex and unwieldy.

The planning of profit is an unresolved problem for the Scientific-Production Association. Considering the specific nature of the Scientific-Production Association, profit planning should be based on direct accounting derived from the product list and the standard profitability that is established for kinds of product in percentage of labor expenditures. Another method is to use when price setting a normative of profit achieved by the enterprise and not restrict its upper level of 20 percent, as is now done.

The existing system of establishing incentive markups to wholesale prices for new (modernized) kinds of product needs to be amplified. Price markups must be established for experimental batches of complicated manufactured articles having a long production and installation cycle. We are not speaking about experimental prototypes used for design work, but of manufactured articles that are sold to a customer for industrial use.

To determine the percentage of highest category quality product that is manufactured by the Scientific-Production Association, V.P. Belyakov has suggested establishing an indicator for the percentage of highest category quality product. It is defined

as the sum of the proportions of series product that is certified for the State Mark of Quality, and new manufactured articles which by their parameters correspond to the best domestic and foreign models, and to the price of which an incentive markup is affixed for efficiency. Such an indicator, in Belyakov's opinion, will stimulate both the certification of series produced product and the assimilation of new equipment.

The RSFSR Minister of the Textile Industry, A.M. Paramonov, pointed out the importance of prices in stimulating the manufacture of consumer goods. Within the first four years of the Tenth Five-Year Plan the output of product bearing the State Mark of Quality and index "N" at enterprises of the RSFSR Textile Industry increased more than 2-fold. It provides an annual updating of the assortment of consumer goods of 40 to 45 percent. This is promoted by work being done by the USSR State Committee on Prices to improve price setting.

To stimulate the raising of product quality and the improving of the consumer properties a system of markups to the wholesale prices for additional finishing of fabrics and articles has been established. Differentiating between wholesale and retail prices and the introduction of normative parametric price lists are prompting an improvement in the work of industry.

In 1979 the USSR State Committee on Prices as an experiment permitted four industrial associations (Vladivostok Cotton Industry, Moscow Cotton Industry, Ivanovo Cotton Industry and the Leningrad Cotton Industry) to examine at their artistic-technical councils with the participation of representatives of commerce and price setting organs questions having to do with including new product in goods of an improved quality. The work of the councils yielded positive results: the responsibility of the enterprises for the quality of fabrics and their exactingness toward their technical and artistic-aesthetic execution was increased; and favorable conditions were created for expeditious adoption of new fabrics into production.

V.V. Tkanchenko, the Chairman of the USSR State Committee for Standards, devoted his speech to the interconnection between standardization and price setting. In the Tenth Five-Year Plan the USSR State Committee for Standards, the ministries and departments have been working on standardizing based on programs for the comprehensive standardization of the most important kinds of product. This is a completely new approach, which makes it possible to more fully balance and coordinate requirements for raw materials, materials and assembly parts and to optimize the use of material and labor resources, and production capacities based on sound technical-economic norms. This work is closely tied with measures for improving wholesale prices and rates.

The comprehensive approach in standardizing is creating the conditions for establishing a system of prices that is based on the calculation of the most important components of production.

In speaking of the necessity to further improve the forms and methods for certifying product, V.V. Tkachenko noted that the existing practice of certifying product into three categories - highest, first and second - is being retained. At the same time the requirements for highest quality product are being raised; and measures are being stipulated to speed up the removing from production of outdated product and to raise the economic responsibility of enterprises for quality of product. Improving the work in standardization and price setting is being ensured by the joint solution of such major problems as the combination and coordination of technical and economic requirements when drawing up normative-technical documentation, estimating the economic savings at all stages of developing new articles, creating specific barriers to the production of economically inefficient equipment and others.

A.V. Bachurin, the Deputy Chairman of USSR Gosplan, devoted most attention to questions of drawing up and using of the indicator of normative net product.

In past years an adequate amount of experiments has been performed to convincingly demonstrate the advantages of using this indicator as compared with the indicator of gross (commodity) product in the processing sectors of industry, and particularly in machine building, the light and food industry and the construction materials industry.

The normative net product indicator provides a more precise evaluation of the labor contribution of each production collective to the creation of national income. It does not hinder, like the gross product, the lowering of the consumption of materials and the expansion of the output of new progressive manufactured articles, which, as a rule, require additional expenditures of labor, particularly during their assimilation. In addition, the normative net product indicator creates a reliable basis for improving the planning of labor productivity and the wage funds. For this reason when formulating price lists it is necessary to ensure the timely development of the normative net product indicator. The USSR Gosplan and the USSR State Committee on Prices have named several ministries which must develop a normative net product indicator. It is necessary to hasten work in preparing sectoral methodological instructions. The union republics face a no less important task in adopting into practice the normative net product indicator.

The basic problems of improving the system of prices, which were outlined in N.I. Glushkov's report, were extensively discussed in five problem sections: the theory and methodology of price setting; prices for the product of the fuel and energy complex and the raw material sectors of heavy industry; prices and normative net product for machine building product; prices for consumer goods and rates for services to the population; and prices for agricultural product.

The deputy chairmen of the USSR State Committee on Prices L.A. Ayvazov and A.I. Kuznetsov, the Department Chairman of the Academy of the National Economy Yu.V. Yakovets, the Director of the Scientific Research Institute of Prices Yu.V. Borozdin, and a member of the USSR State Committee on Prices A.A. Stolbov gave reports on the results of the work of the sections.

The conference made far reaching recommendations aimed at improving planning, methodological and organizational work for improving the system of wholesale prices and rates for ensuring the successful implementation of the CPSU's economic policy.

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REGIONAL DEVELOPMENT

INTEGRATED DEVELOPMENT OF NEW SIBERIAN RAIL LINK URGED

Novosibirsk *Ekonomika i Organizatsiya Promyshlennogo Proizvodstva* [EKO] in Russian No 5, 1980 pp 17-31

[Article by Candidate of Economic Sciences A. A. Kin, of the Novosibirsk Institute for the Economy and Organization of Industrial Production under the Siberian Division of the USSR Academy of Sciences: "The Path to the Riches of Siberia"]

[Text] The Decree of the CPSU Central and the USSR Council of Ministers "On Improving Planning and Strengthening the Effect of the Economic Mechanism on Raising Production Efficiency and Work Quality" provides specific comprehensive programs for the development of the individual regions and territorial production complexes (TPK) as the most important component in the state socioeconomic development of plans. The program for the development of the BAM [Baykal-Amur Mainline] zone has been named among the primary programs in the immediate future.

The BAM is a construction project which is unprecedented in terms of scope and complexity. The latitudinal extent of the mainlines of the section under construction from Ust'-Kut (the Lena Station) to Komsomol'sk-na-Amure via Nizhneangarsk, Chara, Tynda and Urgal reaches 311 km. Considering the sections in operation between Tayshet--Ust'-Kut and Sovetskaya Bayan'--Komsomol'sk-na-Amure, the length of the line from west to east exceeds 4,300 km. Moreover, on the Tayshet--Ust'-Kut section, more than 700 km of double tracking is being built.

Along the meridian, the BAM intersects the 400-km long line between Bam--Tynda--Berkazii connecting the Transsiberian with the regions of Southern Yakutia which are rich in coking coals and iron ore.

The BAM has crossed the northern regions of Irkutskaya Oblast and reached Baykal. In Khabarovskiy Kray, construction has been completed on the Far Eastern ring (Komsomol'sk-na-Amure--Urgal--Izvestkovaya--Khabarovsk), and construction on the central section of the mainline is ahead of schedule. In the west the line is moving into Chitinskaya Oblast, and in the east into Amurskaya Oblast. The "small" BAM has been put into permanent operation.

By the end of the current five-year plan, the total length of the BAM mainlines will exceed 2,000 km. During the 11th Five-Year Plan, construction will be completed on the sections from Baykal to Urgal, and the BAM will go into service as a through-traffic line.

Even now the mainline has begun to repay the funds spent on its development. Products from the lumber industry of the Irkutsk and Khabarovsk sections of the BAM zone are already being shipped. Power coals from the Teryungri open-pit mine, the pioneer of the Southern Yakut TPK, are being received for the fuel and energy balance of the nation.

The BAM has entered the concluding phase of construction. The center of gravity of the scientific research, design and economic work is being shifted to the questions of developing a broad range of production in the zones which gravitate to the BAM along its route.

A Treasurehouse of Riches

The BAM is opening up new opportunities for tapping the natural resources in the northern territories of the Eastern Siberian and Far Eastern economic regions. The sections of the BAM which are under construction and in operation pass through the territory of Irkutskaya Oblast, the Buryat ASSR and Chitinskaya Oblast in the Siberian region, and comprise approximately one-half of the latitudinal extent of the main line.

The zone for the primary economic development of the raw material resources and economic development in the Siberian region comprises 1 million km². Concentrated in it are large and economically efficient reserves of diverse minerals.

In Irkutskaya Oblast, a number of promising structures for oil and gas has been discovered. There also have been found significant deposits of potassium salts, shows of copper and lead-zinc mineralization, and the Angara-Ilim iron ore province is nearby. The BAM zone in the Buryat ASSR includes major deposits of nonferrous and rare metals. In this same region is the Kholodnenskoye deposit of polymetallic ores; the Synnyrskiy area of potassium-containing minerals has attracted attention as a source of a comprehensive raw material for producing aluminum oxide and potassium fertilizers.

In Buryatia, the BAM runs directly by the large Molodezhnoye chrysotile-asbestos deposit which is unique in terms of quality. The well-known Udokan deposit of copper sandstones and the new Charo-Iokkinskiy iron ore basin gravitate to the Chita section of the mainline. The region possesses significant energy resources and is rich in balneological springs. A remarkable feature of this zone is the grouped stratification of the minerals. The concentration of natural riches contributes to their integrated development and to the creation of large TPK and individual industrial centers.

In the economic zone along the Siberian portion of the BAM, a number of territorial production formations is being established. On the territory

gravitating to the Tayshet--Ust'-Kut section, the formation of the Bratsk--Ust'-Ilimsk TPK is being completed. It will include the Bratsk and Ust'-Ilimsk CES, the Bratsk lumber industry complex and a heating equipment plant, an aluminum plant, the Korshunovskiy mining and dressing combine, the Ust'-Ilimsk lumber industry complex, and a number of other industrial enterprises.

In Irkutskaya Oblast, in the zone of the Ust'-Kut (Lena)--Kunermu section, it would be possible to develop the Upper Lena (Verkhne-Lenakiy) TPK. In this region, a large center has already been formed for railroad (the Lena Station), air (the Ust'-Kut Airport) and river (the port of Osetrovo) transport. They are responsible for a large portion of the freight for the northern regions of Irkutskaya Oblast, the Yakut ASSR and Magadanakaya Oblast. In line with the further economic advance across the territory along the BAM, the transport system must be supplemented by roads. Without them it would be difficult to tap the natural resources even within the range of the railroad.

The absence of roads close to the mainline would entail major national economic losses. Thus, the experience of the Transsiberian has shown that even a brief breakdown of an individual section of the railroad because of a natural disaster (flooding) can cause losses for the national economy which surpass by scores of times the expenditures which would have been needed to build a road parallel to the Transsiberian. Along the BAM, similar situations are also not excluded. The temporary existing service (construction) roads could be turned into permanent ones, by spending 2-fold less additional funds than on building the roads from scratch. However the work must be started immediately before the service roads become unusable.

The development of water transport based on the port of Osetrovo is being held up by the shallow guaranteed depths in the headwaters of the Lena. The alternative is to build a new port in the area of Kirensk and an Ust'-Kut--Kirensk railroad or a storage dam and by using it in the navigation season to control the run-off of the Lena.

The construction of the BAM will make it possible to begin extensive development of the lumber and woodworking industry in the Upper Lena TPK. The volume of lumber felling can reach 20 million m^3 a year. The lumber raw material resources make it possible to create a large pulp and paper combine in this region.

However, the raw material resources can be caused serious harm, if the economic organizational questions are not settled of systematizing the forestry utilization system. The problem is that the enterprises outside the system of the Minlesprom [Ministry of Timber and Wood Processing Industry] (independent fellers) fell timber basically for their own needs. For example, in Kazakhinsko-Lenskiy Rayon, up to 80 percent of the timber industry areas have been turned over to the independent fellers. With the calculated output volume of 5 million m^3 , the independent fellers produce a little more

than 900,000 m³ a year. Their enterprises, as a rule, are small and poorly equipped technically. Obviously, the question of timber utilization by such organizations must be settled by setting up interfarm state and cooperative associations.

The Nepsko-Botuobinskiy dome which is promising for hydrocarbons gravitates to the Upper Lena area. In terms of the transport accessibility conditions, the region can become a prime one in developing the oil and gas provinces of the Siberian Platform. The starting up of work to locate the oil and gas reserves as early as to time the start of intensive exploitation of the oil and gas fields in the Nepsko-Botuobinskiy dome for the completion of construction of the BAM requires a change in the prospecting strategy, since the traditional methods which have been tested out in other regions are little suited here.

The Nepsko-Botuobinskiy dome is covered by thick layers of halogenic deposits, and major accumulations of potassium salts have been discovered. The area covered by the salts exceeds the area of a similar deposit in the Pripyat Depression in Belorussia, one of the basic suppliers of potassium raw materials. The prospects of discovering oil and gas and the accumulation of potassium salts open up an opportunity to create large chemical industry enterprises which would produce mineral fertilizers in the Upper Lena TPK.

Above all the significant reserves of lead, zinc, molybdenum, the chrysotile-asbestos deposit and so forth are the prerequisite for the formation of the Northern Baykal TPK. The economic specialization of the development zone is determined by the mining enterprises. Their creation depends largely upon transport accessibility.

The Road to the Treasurehouse

The construction of the BAM in the Siberian region is ahead of schedule. In October 1978, a year ahead of time, the mainline crossed the border of the Buryat ASSR, and by 1979, had reached the shores of Baykal. The mainline already stretches 1,000 km from Tayshet to Baykal. The most difficult sections still lie ahead. Of the remaining earthmoving, almost the entire volume is rock.

More than 20 tunnels remain to be built. There are four double-track promontory tunnels on the northern tip of Baykal, and then the largest Severo-Muyskiy which is 15 km long. Ahead are the uninhabited permafrost areas of Chitinskaya Oblast, the 2-km Kodarskiy Tunnel, and a bridge over the Vitim.

The completion of the BAM as a through-traffic line on the dates stipulated by the directive decisions depends upon the course of construction in the section to the east of Baykal on the territory of the Buryat ASSR. The bottleneck in this section of the route is the Severo-Muyskiy Tunnel. The course of construction indicates that the route by the end of 1981 will reach the western portal of the Severo-Muyskiy Tunnel, while the tunnel

itself is planned to be opened by the end of 1984. Consequently, during a 3-year period, the construction workers will be forced to deliver hundreds of thousands of tons of freight, including large-sized bridge elements, over the mountain service roads. As yet the construction of the tunnel is behind the cutting schedule. This has been caused by a number of factors, but the most important of them are the very difficult geological engineering and hydrogeological conditions. As yet neither foreign nor Soviet transport construction workers have experience in building tunnels under such conditions.

The alternation of hard and crushed, loose rock saturated with thermal waters does not provide an opportunity to employ a stable drilling method. As construction is underway, the plans for building the sections of the basic tunnel must be adjusted or redrawn. For the steady construction of the ground-level sections of the BAM, it is advisable to provide for the building of a rail bypass for the Severo-Muyskiy Tunnel. Such a bypass can be created by the transport construction workers of the Buryat section during the year, and would require capital investments of not more than 1 percent of the estimated cost of the BAM Buryat section, or 8 percent of the cost of the tunnel itself.

The railroad bypass for the Severo-Muyskiy Tunnel will make it possible to solve a whole series of problems. In the first place, due to the dependable delivery of freight, construction will be accelerated on the most difficult section of the route from the eastern tunnel portal to the Vitim River. This, in turn, will make it possible to begin building the bridge over the Vitim, to substantially reduce the costs, and will accelerate the arrival of the mainline in the region of the Udokan Basin via the Kodarskiy Tunnel.

Secondly, the railroad bypass will provide dependable operation of the route as a through-traffic line for trains prior to the completion of the tunnel. The bypass can also be useful in the course of operating the Severo-Muyskiy Tunnel. The tunnel is being built in an area of increased seismicity. The railroad bypass would make it possible to prevent interruption of through traffic on the route and to rapidly overcome the consequences of probable earthquakes.

Thirdly, a rail bypass for the Severo-Muyskiy Tunnel will provide an opportunity to begin developing highly efficient natural resources 2-3 years earlier. It is a question primarily of the Molodezhnoye chrysotile-asbestos deposit which excels in high-quality asbestos grades. The rapid development of the deposit is necessitated by the scarcity of the textile asbestos grades and by the good world market conditions.

With the development of the Molodezhnoye deposit, a major export base for asbestos will arise in the zone of the BAM. Asbestos which now comes from the European regions of the nation is purchased by Japan. The completion of the Molodezhnoye mining and processing combine (GOK) will make it possible to substantially shorten the asbestos shipments for export. The beginning of construction on the GOK is completely determined by the dates

for creating the transport approaches. The rail bypass will make it possible to begin building the GOK 2-3 years before construction of the Severo-Mayskiy Tunnel is completed. The Molodezhnoye combine can already be in operation by the time the route is opened for through traffic.

The reaching of the Vitim region over the rail bypass will make it possible to begin building the Mokskaya GES, a source of power supply not only for the enterprises of the Northern Baykal TPK, but also for the Udokan industrial center.

The rail bypass will also accelerate the agricultural development of the lands in the Mayskiy intermontane trough, which in terms of climatic conditions is extremely favorable for the development of vegetable raising and dairy farming. Thermal waters provide an opportunity to grow farm products year-round in this region.

The Integrated Development of Siberian Riches

The planning work lags noticeably behind the possibilities of economic development for resources in the BAM zone. For example, only after the substantiation of reserves at the Kholodnenskoye polymetallic ore deposit did specialists begin designing projects for the building up and development of the deposit. The completion of the work at the designated times after the BAM will reach the planned shipping volume most probably will not make it possible to consider the transporting of raw materials from the Kholodnenskoye deposit.

At present for the Kholodnenskoye deposit there are no plans for the structure of the operating projects and their territorial location. It is merely clear that the mining and processing combine cannot be located in the Baykal basin due to considerations of protecting the environment and primarily the Baykal waters. As yet models have not been worked out for the location of the ore dressing and processing projects or the volumes of their shipments by routes. Because the mainline will reach the deposit by the end of 1981, such problems require an immediate solution.

Planning studies and organizational decisions are required for the questions of creating the GOK for the Molodezhnoye chrysotile-asbestos deposit and building the Mokskaya GES using the forces of a single construction base with proportional participation of the Ministry of Power and Electrification and the Ministry of the Building Materials Industry. Such experience has been gained, for example, in building the Bratsk GES. Here it is economically disadvantageous to set up two independent departmental organizations.

To the north of Uoyan lies the Synnyrskiy Massif which is unique in terms of chemical composition and reserves. Within this area pseudoleucite rock has been discovered, and this has been called "synnyrites." This compound raw material contains potassium and aluminum oxides as well as a number of other metals.

The processing of the synnyrites can be organized on an unprecedented scale. On the basis of them it would be possible to set up an enterprise producing potassium fertilizers, aluminum oxide and slurry for cement production. However this production necessitates the working out of chemical and metallurgical production methods. The scientific research and design organizations of the nation are engaged in creating such technology. The organizing of large-scale, economically efficient production on the basis of the methods will make it possible for many decades to come to supply the aluminum industry with raw materials, and the nation's agriculture with efficient potassium fertilizers. Also important is the fact that portland cement from synnyrites could meet the ever-increasing demand for cement at the construction enterprises of the BAM zone.

In the north of Chitinskaya Oblast, on the basis of copper ore deposits, the Udokan industrial center will be organized. The efficiency of the Udokan industrial center is large determined by the solving of technical problems, and by a correct choice of the forms and methods of developing the area. The scale of work in developing the deposit and the severe natural and complicated economic conditions cause a truncated production structure of the center. A GOK will comprise its basis. A more complicated chemical and metallurgical complex will be developed outside the territory of the industrial center.

During the Tenth Five-Year Plan, additional exploration is to be completed at the Udokan deposit as well as the creation of prerequisites for its industrial operation. The exploitation of the copper-bearing sandstone will be carried out basically by the open-pit method. For this 90 million m^3 of rock must be removed. Such an amount of work cannot be carried out using conventional methods. For the development of Udokan there must be equipment corresponding to its specific mining-geological and climatic conditions.

It is rational to carry out the mining work using equipment of increased capacity and reliability. For Udokan they plan to develop special drilling and blasting, earthmoving, mining-transport and dressing machines with an increased unit capacity. The plans provide, in particular, for the operation of dump trucks with a capacity of 180 tons and more, excavators with a shovel capacity of at least 12 m^3 , and wheeled bulldozers with a power up to 1,000 horsepower, a crusher with a productivity of 3,000 tons of ore per hour, self-reducing mills with a capacity of 310 m^3 , and so forth. The organization of the production complex on such a technical production basis means the carrying out of a labor-saving policy.

The development of the models of high-powered equipment and its production for the requirements of the Udokan industrial center must be accelerated in order to begin the extensive tapping of the copper reserves by the time the route is laid across the Chara region. At present, there is the urgent problem for Udokan of working out the technology for processing the copper ores. For this the time has come to begin developing an experimental industrial enterprise on the spot.

In the BAM zone there is already experience in setting up a large-scale mining enterprise. This is the Neryungri coal complex within the Southern Yakut TPK which is being formed. Here, as nowhere else in any region of new Siberian development, the transport artery has been built at a fast pace and was completed by the beginning of the extensive undertaking of development work at the deposit. The arrival of the railroad at the Neryungri coal deposit has made it possible to begin dispatching power coals for the national economy ahead of time. The major coal-transporting conveyor (the Neryungri coal mine--the small BAM--Vostochnyy Port) has gone into operation on time and is ready to dispatch coking coal for export. The capacity of the conveyor will rise continuously. By 1986, for Japan alone the deliveries of coking coal will be 5 million tons a year.

In contrast to the other new development regions, here a construction base was created rapidly, and the building of a housing construction combine is being completed. For the first time in the practice in developing the northern territories, a temporary settlement has been organized outside the limits of the territory allocated for the construction of the permanent settlement. And although the construction of the permanent settlement has fallen behind somewhat, here to a certain degree they have succeeded in avoiding the shortcomings inherent to the development of many northern towns. In building the new Neryungri, modular housing construction has been successfully combined with wooden houses which give the town an unique appearance.

The construction workers of the Neryungri coal complex have encountered difficulties caused not only by the extreme natural climatic conditions but also by shortcomings in the plans. The estimated cost of construction has been set without considering the rational sequence of the predesign and preplan work which has often been carried out simultaneously with the working out and approval of the designs. This has led to a decline in the quality and reliability of the plans.

In the very course of building the complex, its estimated cost has been adjusted upwards and has surpassed the initial amount by almost 3.5-fold. However, regardless of the increased cost of the construction and installation work, the dates for completing the basic projects of the complex have been left as before.

Much from the experience of developing the new regions of Southern Yakutia can and must be used in forming the Udokan industrial center, naturally, considering the particular features in the sequence of work at Udokan.

Living and Working Conditions

From the experience of developing the remote, uninhabited regions of the country such as the north of Western Siberia, the greatest difficulties arise in the first development stage. During this period the labor collectives are formed, and there is an acute shortage of housing and facilities of the sociodomestic infrastructure. At the same time, work is carried out

in developing the facilities of the region-wide production infrastructure and basic production. The lack of a proper construction base and the shortage of construction personnel, for solving the problem, make it necessary to resort to putting up temporary housing and other infrastructure projects.

In the development of the Udokan area, a different development sequence is possible, if it is considered that here work will get underway, in all probability, in the 12th Five-Year Plan. There is time to work out the questions of using the watch method¹ for developing the region. It can be employed during the stage of developing the experimental industrial enterprise and building permanent housing for the personnel who will build and operate the deposit.

Chita can be recommended as the base city. For efficiently organizing labor using the watch method, it is essential first of all to settle the organizational questions of creating housing for the watch personnel and delivering personnel to the working area.

At present, the standard structures used on the watches are produced by hundreds of enterprises under different departments. The diversity in designs and construction methods for the watch settlements does not make it possible, in essence, to carry out integrated development. For precisely this reason, comfortable housing conditions have not yet been organized for the watch workers. The standardizing of the types of watch settlements, buildings and structures used in them remains the primary task, and then, on this basis, there is the reorganization of the mobile housing construction industry.

The region of the Upper Chara Basin, where the sites are being planned for building the town is marked by a rare combination of bad natural-climatic and construction engineering conditions which have no analogues in the domestic practices of developing the northern territories. For this reason the development of the natural resources in the Udokan region using traditional methods would require significant expenditures on organizing the city with comfortable conditions for a population of many thousands. The housing difficulties characteristic of the new development regions will not help to attract and retain personnel in the region. In this regard, in the plans for the development of Udokan, the available housing is to be 18 m² per person with an average cost of 600 rubles per m².

From the traditional method of developing Udokan, we must obviously move on to methods employing a rotating labor force. While in the former instance the ratio between persons employed in the basic and service sectors

¹On this question, see the selection of articles in the journal EKO, No 10, 1979.

as 1:10 (we should note that in the north of Western Siberia, a ratio of 1:16 has been observed), with a watch organization, it average 1:2.² Here there is a substantial reduction in the number of persons who are simultaneously in the work area while the living conditions for the shift personnel is organized in hotel-type houses with improved comfort conditions.

With the watch organization of labor, a person feels that his stay in a region with bad natural and climatic conditions is temporary. This substantially reduces dissatisfaction and the disappointment of workers related not to the working conditions but rather the living conditions.

It must be pointed out that in the mining sector of the Udokan industrial center, male labor will be basically employed. Questions will arise of finding jobs in the proper area for second and third family members. With the watch method of developing Udokan and the choice of Chita as the base city, such problems will not arise, or having arisen, are easily settled. This is a noteworthy feature of the watch system, if one considers the general situation with labor resources in Siberia.

The means of transport presently used for delivering watch personnel to work areas (predominantly helicopters and airplanes) are not all-weather. This introduces an element of ambiguity and instability into the organization of production. The attempt to solve the problem "head-on," by using aircraft with higher performance features, entails major expenditures on building landing strips, enterprises for servicing aircraft equipment, and so forth.

However, an all-weather and universal means of transport is well known, and the economic effectiveness of it has been proven by calculations. Such a means is the dirigible. Its basic advantages are low fuel consumption, an insignificant effect on the environment, the cheapness of transporting cargo and a broad range of possible uses. The technical problems of dirigible construction, as experts feel, have been solved. It is a question of creating the corresponding sector. Incidentally a dirigible can be used not only as a dependable means of transport but also as a "flying hotel" for the watch personnel.

During a watch, as a rule, a person works under extreme conditions and labors in "forced" situations. The existing labor legislation does not fully consider these particular features, and, consequently, to a certain degree holds up the extensive introduction of this progressive method.

²The experience of the development of the foreign North provides examples of a more rational ratio of persons employed in basic production and the service sectors. For example, at the nickel combine in Thompson, Canada, there is one employee at the service enterprises for every two employees in basic production.

The time has come to incorporate changes in the legislation which would take into account the basic features of the methods for organizing labor with a changing work force. Closely linked to this question is another, namely, improving the material incentive system for the watch workers and above all the system of benefits which would objectively consider, on the one hand, the particular features of working under watch conditions, and on the other, would reflect its national economic significance.

We are just beginning to tap the natural riches of the territories along the BAM. Precisely now, considering the experience of developing the north of Siberia and the construction of the BAM, it is essential to choose those directions for the development of equipment and production methods and those methods for planning and managing the economic development process which would make it possible to put the riches of the BAM zone into national economic circulation with the best economic and social results.

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